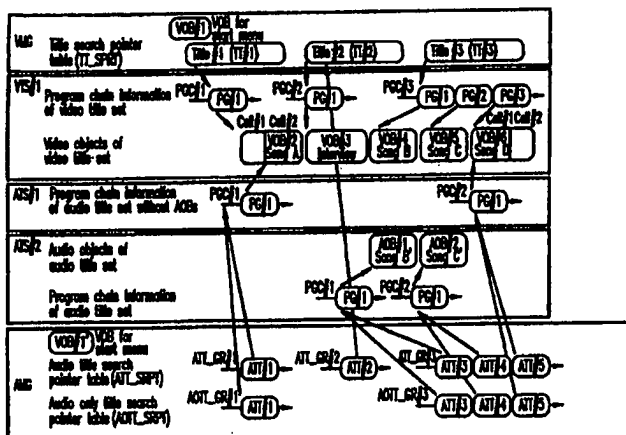




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(54) Title: OPTICAL DISK, REPRODUCTION APPARATUS, AND REPRODUCTION METHOD



## (57) Abstract

An optical disk includes: a data region; and a management region. The data region stores: at least one audio object containing audio information; and at least one video object containing video information and audio information, wherein the management region stores a plurality of first management information units for managing progress of reproduction of the at least one audio object and a plurality of second management information units for managing progress of reproduction of the at least one video object, each of the plurality of first management information units including audio reproduction attributes and first path information indicating a reproduction order of the at least one audio object, each of the plurality of second management information units including video reproduction attributes and second path information indicating a reproduction order of the at least one video object, and wherein the management region further stores a first connection table containing first connection information and second connection information, the first connection information indicating a relationship of connection between the plurality of first management information units and the plurality of second management information units, and the second connection information indicating a relationship of connection among the plurality of first management information units.

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## DESCRIPTION

## OPTICAL DISK, REPRODUCTION APPARATUS, AND REPRODUCTION METHOD

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## TECHNICAL FIELD

The present invention relates to an optical disk for storing digital data of multimedia data including audio information and moving image information that are associated with each other, as well as an apparatus and a method for reproducing the same.

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## BACKGROUND ART

Conventionally, CDs (compact disks) and LDs (laser disks) are known as optical disks for storing and reproducing audio information and/or moving image information.

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A CD is an optical disk having a diameter of 12 cm. A CD carries audio information stored thereon which has been quantized by using a linear PCM method. CDs are widely prevalent as a storage medium for music-oriented applications.

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An LD is an optical disk having a diameter of 30 cm. An LD carries moving image information stored thereon in the form of analog signals. LDs are widely prevalent as a storage medium for image-oriented applications such as movies.

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In addition to such uses, applications which cannot be distinguished to be either simply music-oriented or image-oriented have emerged, e.g., operas and the

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recently-evolved music clips (i.e., music accompanied by images).

5       Herein, those uses which cannot be distinguished as either music-oriented or image-oriented will be referred to as being directed to "image-accompanied music".

10       In the case of applications of image-accompanied music, each user may prefer a different mode of viewing/listening. Some users may think that the usual video reproduction is sufficient, while others may wish to only enjoy high quality sounds/voices without any images, and yet a number of users may wish to enjoy music in high  
15       quality sounds/voices while being able to enjoy interviews and the like along with images.

#### DISCLOSURE OF INVENTION

20       According to the present invention, there is provided an optical disk including: a data region; and a management region, wherein the data region stores: at least one audio object containing audio information; and at least one video object containing video information  
25       and audio information, and wherein the management region stores a plurality of first management information units for managing progress of reproduction of the at least one audio object and a plurality of second management information units for managing progress of reproduction  
30       of the at least one video object, each of the plurality of first management information units including audio reproduction attributes and first path information indicating a reproduction order of the at least one audio

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object, each of the plurality of second management information units including video reproduction attributes and second path information indicating a reproduction order of the at least one video object, and wherein the management region further stores a first connection table containing first connection information and second connection information, the first connection information indicating a relationship of connection between the plurality of first management information units and the plurality of second management information units, and the second connection information indicating a relationship of connection among the plurality of first management information units.

In one embodiment of the invention, the management region further stores a second connection table consisting of the second connection information indicating the relationship of connection among the plurality of first management information units.

In another aspect of the present invention, there is provided a reproduction apparatus for reproducing an optical disk, the optical disk including a data region and a management region, the data region storing: at least one audio object containing audio information; and at least one video object containing video information and audio information, wherein the management region stores a plurality of first management information units for managing progress of reproduction of the at least one audio object and a plurality of second management information units for managing progress of reproduction of the at least one video object, each of the plurality of first management information units including audio

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reproduction attributes and first path information indicating a reproduction order of the at least one audio object, each of the plurality of second management information units including video reproduction attributes and second path information indicating a reproduction order of the at least one video object, and wherein the management region further stores a first connection table containing first connection information and second connection information, the first connection information indicating a relationship of connection between the plurality of first management information units and the plurality of second management information units, and the second connection information indicating a relationship of connection among the plurality of first management information units, the reproduction apparatus including: a reading section for reading at least one of the plurality of first management information units from the management region; and a reproduction section for reproducing the audio information contained in the at least one audio object in accordance with the at least one first management information unit that has been read.

In another aspect of the present invention, there is provided a reproduction apparatus for reproducing an optical disk, the optical disk including a data region and a management region, the data region storing: at least one audio object containing audio information; and at least one video object containing video information and audio information, wherein the management region stores a plurality of first management information units for managing progress of reproduction of the at least one audio object and a plurality of second management information units for managing progress of reproduction

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of the at least one video object, each of the plurality of first management information units including audio reproduction attributes and first path information indicating a reproduction order of the at least one audio object, each of the plurality of second management information units including video reproduction attributes and second path information indicating a reproduction order of the at least one video object, and wherein the management region further stores a first connection table containing first connection information and second connection information, the first connection information indicating a relationship of connection between the plurality of first management information units and the plurality of second management information units, and the second connection information indicating a relationship of connection among the plurality of first management information units, the reproduction apparatus including: a reading section for reading at least one of the plurality of second management information units from the management region; and a reproduction section for reproducing the video information and audio information contained in the at least one video object in accordance with the at least one second management information unit that has been read.

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In another aspect of the present invention, there is provided a reproduction apparatus for reproducing an optical disk, the optical disk including a data region and a management region, the data region storing: at least one audio object containing audio information; and at least one video object containing video information and audio information, wherein the management region stores a plurality of first management information units

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for managing progress of reproduction of the at least one audio object and a plurality of second management information units for managing progress of reproduction of the at least one video object, each of the plurality of first management information units including audio reproduction attributes and first path information indicating a reproduction order of the at least one audio object, each of the plurality of second management information units including video reproduction attributes and second path information indicating a reproduction order of the at least one video object, and wherein the management region further stores a first connection table containing first connection information and second connection information, the first connection information indicating a relationship of connection between the plurality of first management information units and the plurality of second management information units, and the second connection information indicating a relationship of connection among the plurality of first management information units, the reproduction apparatus including: a reading section for reading the first connection table from the management region; and a reproduction section for selectively reproducing either the audio information contained in the at least one audio object or the video information and the audio information contained in the at least one video object in accordance with the first connection table.

In one embodiment of the invention, the management region further stores a second connection table consisting of the second connection information indicating the relationship of connection among the plurality of first management information units, the reading section



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selectively reading one of the first connection table and the second connection table from the management region, and the reproduction section performing reproduction in accordance with the one of the first connection table and the second connection table.

In another aspect of the present invention, there is provided a method for reproducing an optical disk, the optical disk including a data region and a management region, the data region storing: at least one audio object containing audio information; and at least one video object containing video information and audio information, wherein the management region stores a plurality of first management information units for managing progress of reproduction of the at least one audio object and a plurality of second management information units for managing progress of reproduction of the at least one video object, each of the plurality of first management information units including audio reproduction attributes and first path information indicating a reproduction order of the at least one audio object, each of the plurality of second management information units including video reproduction attributes and second path information indicating a reproduction order of the at least one video object, and wherein the management region further stores a first connection table containing first connection information and second connection information, the first connection information indicating a relationship of connection between the plurality of first management information units and the plurality of second management information units, and the second connection information indicating a relationship of connection among the plurality of first management

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information units, the reproduction method including: a  
step of reproducing the audio information contained in  
the at least one audio object in accordance with at least  
one of the plurality of first management information  
5 units.

In another aspect of the present invention, there  
is provided a method for reproducing an optical disk, the  
optical disk including a data region and a management  
10 region, the data region storing: at least one audio  
object containing audio information; and at least one  
video object containing video information and audio  
information, wherein the management region stores a  
plurality of first management information units for  
15 managing progress of reproduction of the at least one  
audio object and a plurality of second management  
information units for managing progress of reproduction  
of the at least one video object, each of the plurality  
of first management information units including audio  
20 reproduction attributes and first path information  
indicating a reproduction order of the at least one audio  
object, each of the plurality of second management  
information units including video reproduction attributes  
and second path information indicating a reproduction  
25 order of the at least one video object, and wherein the  
management region further stores a first connection table  
containing first connection information and second  
connection information, the first connection information  
indicating a relationship of connection between the  
30 plurality of first management information units and the  
plurality of second management information units, and the  
second connection information indicating a relationship  
of connection among the plurality of first management

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information units, the reproduction method including: a step of reproducing the video information and the audio information contained in the at least one video object in accordance with at least one of the plurality of second management information units.

In another aspect of the present invention, there is provided a method for reproducing an optical disk, the optical disk including a data region and a management region, the data region storing: at least one audio object containing audio information; and at least one video object containing video information and audio information, wherein the management region stores a plurality of first management information units for managing progress of reproduction of the at least one audio object and a plurality of second management information units for managing progress of reproduction of the at least one video object, each of the plurality of first management information units including audio reproduction attributes and first path information indicating a reproduction order of the at least one audio object, each of the plurality of second management information units including video reproduction attributes and second path information indicating a reproduction order of the at least one video object, and wherein the management region further stores a first connection table containing first connection information and second connection information, the first connection information indicating a relationship of connection between the plurality of first management information units and the plurality of second management information units, and the second connection information indicating a relationship of connection among the plurality of first management

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information units, the reproduction method including: a step of selectively reproducing either the audio information contained in the at least one audio object or the video information and the audio information contained in the at least one vide object in accordance with the first connection table.

In one embodiment of the invention, the management region further stores a second connection table consisting of the second connection information indicating the relationship of connection among the plurality of first management information units, the reproduction method further including: a step of selectively reading one of the first connection table and the second connection table from the management region, the reproduction being performed in accordance with the one of the first connection table and the second connection table.

Thus, the invention described herein makes possible the advantage of providing a multimedia disk capable of switching, in accordance with various modes of viewing/listening as desired by a user, between exclusive reproduction of audio information, reproduction of both video information and audio information, and selective reproduction of either video information or audio information without the creation of malfunctions, as well as an apparatus and a method for reproducing such an optical disk, as well as an apparatus and a method for reproducing such a multimedia disk.

This and other advantages of the present invention will become apparent to those skilled in the art upon reading and understanding the following detailed

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description with reference to the accompanying figures.

#### BRIEF DESCRIPTION OF DRAWINGS

5           Figure 1A is a perspective view showing an optical disk according to an example of the present invention.

10           Figure 1B is a cross-sectional view of an optical disk according to an example of the present invention.

15           Figure 1C is an enlarged cross-sectional view of an optical disk according to an example of the present invention.

            Figure 1D is a diagram showing the shapes of pits formed on an optical disk according to an example of the present invention.

20           Figure 2A is a diagram showing the track structure of an optical disk according to an example of the present invention.

25           Figure 2B is a diagram showing the sector structure of an optical disk according to an example of the present invention.

30           Figure 3 is a diagram showing the track structure of an optical disk according to an example of the present invention.

            Figure 4 is a diagram showing the data structure of a video title set according to an example of the

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present invention.

Figure 5 is a diagram showing how a video menu according to an example of the present invention is displayed.

Figure 6 is a diagram showing the data structure of a video title set according to an example of the present invention.

Figure 7 is a diagram showing the data structure of a video manager according to an example of the present invention.

Figure 8A is a diagram showing the data structure of an audio title set of an AOB point type according to an example of the present invention.

Figure 8B is a diagram showing the data structure of an audio title set of a VOB point type according to an example of the present invention.

Figure 8C is a diagram showing the data structure of ATS address information of an ATS management table of an audio title set according to an example of the present invention.

Figure 9 is a diagram showing the data structure of an audio manager according to an example of the present invention.

Figure 10 is a perspective view showing a DVD player according to an example of the present invention

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and a television monitor coupled thereto.

Figure 11 is a view showing a remote control-  
according to an example of the present invention.

5

Figure 12 is a block diagram showing the struc-  
ture of a DVD player as a disk reproduction apparatus  
according to an example of the present invention.

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Figure 13A is a flowchart showing the flow of a  
reproduction process in a video-oriented reproduction  
mode according to an example of the present invention.

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Figure 13B is a flowchart showing the flow of a  
process of reproducing a title in a video-oriented  
reproduction mode according to an example of the present  
invention.

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Figure 14A is a flowchart showing the flow of a  
reproduction process in an audio-oriented reproduction  
mode according to an example of the present invention.

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Figure 14B is a flowchart showing the flow of a  
process of reproducing a title in an audio-oriented  
reproduction mode according to an example of the present  
invention.

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Figure 15 is a diagram showing how a start menu  
stored in a video manager according to an example of the  
present invention is displayed.

Figure 16A is a diagram showing an exemplary  
structure of an application according to an example of

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the present invention.

5       Figure 16B is a diagram illustrating the operation of a disk reproduction apparatus according to an example of the present invention.

10       Figure 17 is a diagram showing the positions on an optical disk at which various data are stored according to an example of the present invention.

15       Figure 18 is a diagram schematically showing the relationship between various reproduced information and objects according to an example of the present invention.

20       Figure 19 is a flowchart showing the flow of a reproduction process by an audio player with video functions according to an example of the present invention.

25       Figure 20A is a diagram showing a specific example of title search pointers of audio manager information and video manager information of an optical disk according to an example of the present invention.

30       Figure 20B is a diagram showing a specific example of a PGC structure of an ATS of the AOB point type of an optical disk according to an example of the present invention.

35       Figure 20C is a diagram showing a specific example of a PGC structure of an ATS of the VOB point type of an optical disk according to an example of the present invention.